Managing Weeds in Switchgrass Grown for Biofuel

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Outline

• Factors affecting weed management during establishment; site, planting date, seeding rate, seed quality, and seeding method.

• Weed management tactics during establishment; stale/false seedbed and mowing.

• Herbicide tools during establishment
• Switchgrass takes longer to establish than cool season grasses (slow to germinate, low seedling vigor)
• Weed control critical during establishment

Planting Decisions (affecting weed management):
• Site
• Planting date
• Seeding method (direct seed, tillage/seed bed prep)
• Herbicides or no herbicides
• Weeds compete for moisture and easily shade slow germinating and less vigorous switchgrass seedlings, reducing their vigor further.

Crabgrass

Green foxtail
Site Selection

• Sites with severe weed problems and/or cool season grasses (CSG) should be avoided or brought under control before seeding switchgrass (start controlling at least the year before planting switchgrass). Planting into existing CSG pastures is difficult.

Ideal planting sites:
• Following a broadleaf crop in which grasses were controlled well
• No till into previous year’s small grain stubble
• Sites without perennial grass weeds
Weeds to Avoid
(or control ahead of time)

- Bermuda grass, quackgrass, perennial ryegrass, orchard grass, tall fescue, etc.
- Heavy seed bank of annual grass weeds (green foxtail, barnyardgrass, large crabgrass, wild proso millet, witchgrass, etc.)

Few selective herbicides to remove these grass weeds from switchgrass. Mowing also not effective on grass weeds.
Planting Date/Seeding Method

• Plant high quality, certified seed (3 -10 lbs PLS/acre)
• Plant from late May to July. Requires warm soil temperatures to germinate (>50°F). Seedling growth is best when air temp. reach 75°-85°F.
• When soil moisture and temp. are good, average emergence will be 10-21 days after planting.
• July and August plantings require more careful irrigation management (small root mass, hot dry weather). August plantings may not overwinter as well.
Plant the Proper Seeding Rate

A good crop stand is half the battle against weeds

\[
\text{6 lbs PLS per acre} \times 100 = 9 \text{ lbs of seed/acre}
\]

66.2\% PLS

- Newly harvested switchgrass seed can have a high percentage of dormancy. Acceptable germination levels often are achieved after one year of storage.
• Plant ¼ to ½ inch deep in firm seedbed.
• Conventional tilled seedbed or no-till drill into standing or killed vegetation. Firm seedbed required.
• Avoid heavy nitrogen fertilization. Favors weeds over switchgrass.
False Seedbed

1. Prepare (till and pack) seedbed in April (destroys winter annual weeds, promotes germination of summer annuals)

2. Control emerged weeds with herbicides (paraquat or glyphosate), flaming, or shallow cultivation.

3. Plant switchgrass.
Without herbicides….

• Mow 2-3 times at a height where only the leaf tips of the switchgrass seedlings are cut, and the growing point is not damaged.
• Mow prior to weed flowering to prevent weeds from producing more seed.
• On established stands can use sheep or goat grazing early in season before switchgrass begins to grow.
If using herbicides...

According to WSU Pesticide Coordinator:

- WSDA has ruled that switchgrass is considered a forage, fodder, and hay crop, (included in crop group 17), and any pesticide labeled for commercial use on switchgrass forage, fodder, or hay can be legally applied.

- Herbicides labeled for use on switchgrass on CRP land can also be legally applied.

**Caution:** for crop injury concerns do not use herbicides on switchgrass unless the label specifically indicates the herbicide is safe on switchgrass. *Not all grasses respond to herbicides similarly.*
If using herbicides...

- Glyphosate or paraquat can be applied prior to emergence of switchgrass to control weeds that have emerged.
- Atrazine PRE on newly seeded switchgrass on both sandy and silt loam soils to control a broad spectrum of annual broadleaf and some grass weeds.
- POST control of broadleaf and grass weeds, several herbicides are available (2,4D, dicamba, quinclorac, sulfosulfuron) All require waiting until the switchgrass has 3 to 4 leaves before applying to avoid injury to the young switchgrass seedlings.
Herbicides useful for establishing switchgrass for biofuel production. (Check labels and follow closely)

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Weeds controlled</th>
<th>Stage of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate (Roundup, others)</td>
<td>Broadleaves, grasses</td>
<td>PRE or dormant application only (only controls emerged weeds)</td>
</tr>
<tr>
<td>Atrazine (Aatrex, others)</td>
<td>Broadleaves, some grasses</td>
<td>PRE to weeds and crop</td>
</tr>
<tr>
<td>Quinclorac (Paramount)</td>
<td>Broadleaves and annual grasses</td>
<td>PRE or POST, 3-4 leaf</td>
</tr>
<tr>
<td>Sulfosulfuron (Outrider)</td>
<td>Broadleaves, Sedges, quackgrass</td>
<td>POST 3-4 leaf</td>
</tr>
<tr>
<td>Dicamba (Banvel, Clarity)</td>
<td>Broadleaves</td>
<td>POST 3-4 leaf</td>
</tr>
<tr>
<td>2,4-D (many products)</td>
<td>Broadleaves</td>
<td>POST 3-4 leaf</td>
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Atrazine

- Restrictions on uses – read label carefully. CRP in certain states only. (NE, OK, OR, TX)
- Good SWG tolerance.
- Excellent PRE herbicide – controls numerous broadleaf and some grass weeds (BYG, YFT, DB).
- Persistent – season long weed control
- Misses many annual grass weeds
- Apply at 1 lb ai/a. Do not incorporate. Atrazine injury can occur on sandy and sandy loam soils with <1 % O.M. and where atrazine is in the zone where the root of the grass emerges.
- Injury is more likely when broadcast seeded rather than drilled.
Quinclorac (Paramount)

- 5.3 to 8 oz/a when SWG seedlings have 3-4 leaves. Max 16 oz/calendar year.
- Controls many annual broadleaves and annual grasses (barnyardgrass, green and yellow foxtail, large and smooth crabgrass)
- Also controls field bindweed (morningglory) and Canada thistle
- Minor crop injury may result, but is normally much less than growth or stand reduction that occurs if weeds are left uncontrolled.
- Include MSO or COC at 1% spray volume.
- Long residual and plant-back restrictions.
Quinclorac

Green foxtail seedlings in established Switchgrass

Quinclorac treated
2,4D vs. Dicamba
- apply when SWG has 3-4 leaves
- both control broad spectrum of broadleaf weeds

• Weak on Russian thistle, kochia, common mallow, chickweed.

• Weak on mustard species.
• Longer soil residual than 2,4D
Outrider, Certainty (sulfosulfuron)

- On new seedings apply after 3 If stage. Can also use on established stands
- Broadleaf weeds less than 4 inches and actively growing. Also controls quackgrass.
- Will not control ALS resistant weeds
- Plan crop rotations accordingly – long residual herbicide
Herbicides useful for **established** switchgrass stands for biofuel production. (Check labels and follow closely)

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<td>Sulfosulfuron</td>
<td>Broadleaves, sedges</td>
<td>PRE or POST, 3-4 leaf</td>
</tr>
<tr>
<td>Aminopyralid</td>
<td>Broadleaves</td>
<td>Established only</td>
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<tr>
<td>Metsulfuron</td>
<td>Broadleaves</td>
<td>PRE or POST, 3-4 leaf Established only</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>Broadleaves</td>
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Second Year - All Plots Treated with Atrazine

- Shawnee
- Kanlow
- Paramount
- Callisto
- Nontreated
- Prowl
- Cave-in-Rock
Milestone, Forefront, Chaparral and others (aminopyralid)

- Established stands only. Rangeland, pasture, hayfield, CRP.
- Several premix products available
- >50 broadleaf weeds – perennial and annual
- Plan crop rotations accordingly – long residual herbicide
Cimarron (metsulfuron)

- Established stands (planted previous year or earlier) on land enrolled in CRP
- Broadleaf weeds less than 4 inches and actively growing
- Will not control ALS resistant weeds (some formulations premix with other MOA herb.)
- Plan crop rotations according – long residual herbicide (pH > 7.9 do not use)
Summary

• Choose proper site, planting date, seeding rate, seed quality, and seeding method to maximize success.

• Utilize stale/false seedbed and mowing especially if not using herbicides.

• Apply herbicides at proper timing and rates and follow labels closely.

• Choose herbicides to match weed spectrum and minimize crop injury.